

EXHIBIT B

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SPOKEN LANGUAGE PROCESSING

A Guide to Theory, Algorithm, and System Development

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Syllable centers can be thought of as *peaks* in sonority (high-amplitude, periodic sections of the speech waveform). These sonority peaks have affiliated *shoulders* of strictly non-increasing sonority. A scale of sonority can be used, ranking consonants along a continuum of stops, affricates, fricatives, and approximants. So, in a word like *verbal*, the syllabification would be *ver-bal*, or *verb-al*, but not *ve-rbal*, because putting the approximant /r/ before the stop /b/ in the second syllable would violate the non-decreasing sonority requirement heading into the syllable.

As long as the sonority conditions are met, the exact affiliation of a given consonant that could theoretically affiliate on either side can be ambiguous, unless determined by higher-order considerations of word structure, which may block affiliation. For example, in a word like *beekeeper*, an abstract boundary in the compound between the component words *bee* and *keeper* keeps us from accepting the syllable parse: *beek-eeper*, based on lexical interpretation. However, the same phonetic sequence in *beaker* could, depending on one's theory of syllabicity, permit affiliation of the *k*: *beak-er*. In general, the syllable is a unit that has intuitive plausibility but remains difficult to pin down precisely.

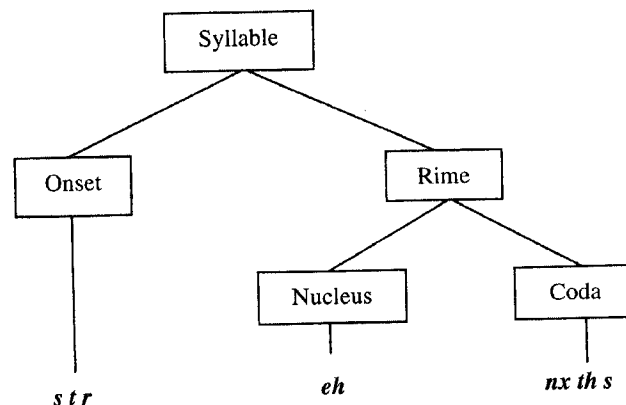


Figure 2.25 The word/syllable *strengths* (*/str eh nxt h s/*) is the longest syllable of English.

Syllables are thought (by linguistic theorists) to have internal structure, and the terms used are worth knowing. Consider a big syllable such as *strengths* */str eh nxt h s/*. This consists of a vowel peak, called the *nucleus*, surrounded by the other sounds in characteristic positions. The *onset* consists of initial consonants if any, and the *rime* is the nucleus with trailing consonants (the part of the syllable that matters in determining poetic rhyme). The *coda* consists of consonants in the rime following the nucleus (in some treatments, the last consonant in a final cluster would belong to an *appendix*). This can be diagrammed as a syllable parse tree as shown in Figure 2.25. The syllable is sometimes thought to be the primary domain of coarticulation, that is, sounds within a syllable influence one another's realization more than the same sounds separated by a syllable boundary.

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